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ABSTRACT

Discusses studies done on primary grade basic skills instruction and student achievement gain since 1973 focusing on content covered, student attention, direct instruction and proportion of student time spent in seatwork rather than on teacher behaviors. Discussed are, teacher centered instruction, student choice of activity, grouping students for learning, classroom management, independent study, verbal interaction, classroom environment and the studies done in these areas. Suggested areas of research in need of further investigation include: academic engaged minutes, and content covered, student choice and individualization, seatwork and work groupings; seatwork materials, and verbal interaction versus seatwork. (MS)

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PRIMARY GRADES INSTRUCTION AND STUDENT ACHIEVEMENT GAIN[1]

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Over the last 20 years, a small group of investigators have attempted to identify those teaching behaviors which were related to student achievement. Their purpose is to learn how to improve the quality of the learning that takes place in school. Although the major focus has been the improvement of cognitive gains--usually in reading and mathematics--there have also been concern with affective outcomes, for example, liking for school and self-concept. Given the current public concern with the mastery of basic skills and the decline in test scores, this continued study of teaching behavior remains important.

This research has traditionally focused on identifying which teacher behaviors (e.g., teacher talk, number of higher order questions, clarity of presentation) were correlated with student achievement gain. This line of research has not been particularly productive, and teacher behaviors which were offered with confidence a few years ago are no longer seen as clearly related to student achievement gains.

The studies which have been published since 1973 have been more promising in terms of suggesting productive instructional strategies; it is these studies which are reviewed here. The major changes in thinking may be summarized as follows:

1) An increased focus on student variables such as content covered (or opportunity to learn) and student attention to relevant academic activities,

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2) A convergence of results supporting several components of a model of "direct instruction,"

3) New information on the proportion of student time spent in seatwork and in discussion, with implications for the role of the teacher.

Cautions and Considerations

First, the reader should note that the research to be reported is limited to instruction in basic skills--reading and mathematics achievement gain--in U.S. grades 1 through 5 (ages 6 through 10). The learning of these basic skills is termed "didactics" (Broudy, 1972) in that learning takes place in a linear, logical, sequential manner.

Broudy believes that most of the standard school subjects fall into the domain of didactics, and that standard achievement tests are the obvious measures of didactics. Although one can make logical separations of elementary skills such as decoding and arithmetic computation and more advanced skills such as arithmetic problem solving and reading comprehension, both sets of skills would be termed didactics by Broudy--and, indeed, research to date with elementary school children has shown these two sets of skills to be highly correlated (.8 to .9).

This focus on didactics does not reflect a lessoned concern with students attitudes and feelings, humane interactions in the classroom, or the teaching of heuristics. These issues, and the distinctions between heuristics and didactics will be discussed later in this paper.

A second caution concerns the overall quality of these studies, many of which contain methodological problems or flaws. For example, the large number of variables studied--in some cases over 500 in a single study--

means that many significant correlations were obtained by chance. Despite these problems, a consistency in the conclusions across studies lends credence to their validity; it is this consistency which is emphasized in this paper. Furthermore, most of these investigators are currently engaged in experimental studies to validate and probe their correlational results.

The third and major caution is the need to proceed with caution in implementing these findings into teacher training programs or into evaluative checklists for teachers. Rather than quickly adopting another round of dictums on "teachers should" as we did in the late 60's and early 70's, it would be preferable to spend time thinking about and discussing the results, their implications, and possible alternatives. For example, although the present findings can permit a wide diversity of teaching styles, some results may seem grim and overbearing. It may be possible, with due reflection, to devise instructional alternatives which are more appealing but equally effective.

Academic Engaged Time

Recently, researchers have moved from a primary concern with teacher behaviors to a number of other instructional variables. Although teacher behavior is still clearly important, attention has recently been focused on student variables. This emphasis on the student has been influenced by the ideas of Carroll (1963) and Bloom (1976). Two particularly useful student variables are 1) content covered or "opportunity to learn" and 2) student attention or engagement. These two variables have been combined here into the concept of academic engaged time. This concept, as originally developed by the staff at the Far West Laboratory (Berliner et al., 1976) refers to

the time which a student spends engaged in academically relevant material which is of a moderate level of difficulty. Although content covered, student attention, and academic engaged time are closely related, content covered is the more critical variable, since it is closer to the outcome measures. However, because it is easier to obtain data on academic engaged time, most of the results reported below concern academic engaged time. In this paper, academic engaged time will be used as a tentative proxy for content covered, but the prime importance of content covered, particularly for didactics, should be emphasized.

Content covered. Content covered or "opportunity to learn" (Carroll, 1963) has been studied in many ways, including inspecting the content of textbooks used (Pidgeon, 1970), asking teachers to indicate the percent of students who have had an opportunity to learn each item on the test (Husen, 1967; Comber and Keeves, 1973; Chang and Raths, 1971), counting the number of pages of the common textbook covered during the semester (Good, Grouws, and Beckerman, in press), coding the content in a short presentation which was relevant to the exam questions (Armento, 1977; Rosenshine, 1971; Shutes, 1969), counting the number of words which the teacher attempted to teach (Beez, 1968; Carter, 1969; Brown, 1969; Barr, 1973) counting the amount of mathematics problems covered (McDonald, 1975), comparing the results of different curriculum programs on general and on curriculum-related post-tests (Walker and Schaffarzick, 1974) and coding the level of the workbook the students completed just before they took a post-test (Rosenshine, 1976).

In all studies but one (Brown, 1969) significant relationships were found between content covered and student achievement gain. Moreover,

these correlations were usually larger than those obtained for teacher behavior variables. As McDonald (1975, p. 27) noted, "If students have not been taught...some...content or procedure, they simply do not do well on those poritions of the test relevant to that topic."

Although this conclusion sounds like common sense, investigation of content covered has not been common practice in educational research; measures of content covered have seldom been used in the major studies of classroom activities and student progress, (e.g., those by Flanders, by Brophy and Evertson, Stallings and Kaskowitz; by McDonald, by Soar, by Solomon and Kendall, or by Bennett.

Student attention or engagement. Student engagement with material or attention is obviously necessary for student learning. Despite the difficulties of measuring attention (e.g., do reading, writing, listening to the teacher, or following another reader count equally as "attention"?) and the crude and varied procedures used to gather this data, Bloom (1976) found clear and consistent results in the research he reviewed on student attention. In the fifteen studies he reviewed, Bloom found that the correlations of student attention with student gain were about .40 when the student was the unit of analysis, and about .52 when the class was the unit. Stallings and Kaskowitz coded students as attending only when they were obviously working on reading or mathematics activities and not when they were engaged in construction or dramatic play. In that study, time spent involved in reading or mathematics yielded higher correlations (.3 to .6) with achievement than any of the other coded teacher or student behaviors. Similarly, the use of texts, workbooks, or instructional materials yielded

positive results, but no nonacademic activity yielded positive correlations with reading and mathematics achievement.

These two variables of content covered and student attention have yielded the highest and most consistent correlations with achievement gain of any of the classroom variables studied to date. The message is: what is not taught and attended to in academic areas is not learned.

A fairly dramatic example of the advantage of studying academic engaged time can be obtained from the work of Stallings and Kaskowitz (1975). Every fifteen minutes, as part of their observational study, they took a "snapshot" of what every child in the class was doing and the group he was in. Their results on the percentage of time that the average class was productively engaged in reading or math are presented in Table 1 with results given for each Follow Through Model. The rank order for achievement gain in each model is also given. One notes, particularly in reading, a strong correspondence between the relative time spent engaged in reading or math activities and achievement gain. (The results on the Non-Follow Through or control classrooms are also revealing, showing that children were engaged in reading or math relatively frequently in those "traditional" settings). One notes from Table 1 that in reading, children in the top three models in achievement gain were spending about fifty percent more time in academic activities than were children in the lower three models.

It should be emphasized that the amount of time allocated for content coverage may be quite different from academic engaged time; allocated time may include activities that do not require actual involvement in academically relevant material. Thus, we find that in studies which consider only allocated time, most of the results tend to be non-significant (Smith, 1976;

Table 1

Percent engaged time and achievement gain by Follow Through Program

Program	1st grade Reading		1st grade Math		3rd grade Reading		3rd grade Math	
Oregon	54*	1*	27	5	58	2	27	1
Kansas	59	2	22	1	59	3	22	3
Non-Follow Through	50	3	18	3	48	1	22	2
Bank Street	40	6	16	4	38	7	20	4
High/Scope	40	5	20	8	46	-	16	-
Arizona	40	4	14	6	42	6	16	7
Far West	39	8	14	7	41	4	18	6
EDC	29	7	14	2	37	5	24	5

* In each, the first column is average class percent engaged time and the second column is achievement gain rank.

From Stallings and Kaskowitz, Appendix pages R-3 and R-4, and from Appendix O. Appendix O is a separate document which contained the data on Non-Follow Through classrooms.

Rank Order Correlations

1st grade reading: .99 3rd grade reading: .80

math: .17 math: .78

Welch and Bridghma, 1968; Guthrie et al., 1976).

Despite the importance of academic engaged time, it should be emphasized that a teacher is not obligaged to have all of her students 100 percent engaged all of the time. The critical variable is the total academic engaged minutes which occur during the day.

Consider, for example, two teachers whom we studied in Urbana. The teachers were both personable, warm, competent women in their early 30's who were using the same materials--the McGraw Hill Programmed Readers--with similar children--the sons and daughters of college professors and graduate students. The first teacher allotted 30 minutes per day for reading, and ran a tightly structured classroom in which students were recorded as engaged 80 percent of the time. She maintained this high percentage by being very alert to student engagement and using frequent social control--such as saying "Johnny, can I help you?"--when a student wasn't working. The second teacher allotted 60 minutes to reading, but ran a looser classroom and was less insistent on high engagement. The students in the second teacher's class averaged academic engagement only 65 percent of the time.

If one computes the number of engaged minutes, then the first teacher averaged 24 engaged minutes per day (80 percent of 30 minutes) whereas the second teacher averaged 39 engaged minutes because she allotted more time. These differences were reflected in our results: during the ten weeks of our study, the students in the second classroom covered proportionately more books in the McGraw-Hill readers than did the equally bright children in the first classroom. Thus, a teacher is not obligated to maintain high student engagement at all times; what is more critical is the total number of academically engaged minutes and the amount of content covered.

Unfortunately, it is not yet known just how many academic engaged minutes or how much content coverage is sufficient or necessary. Indeed, we have little data on the academic engaged time actually occurring in schools. One source of such information is the study by McDonald (1976). In this study, observers coded, among other things, the "productive minutes" or number of minutes per day of academic engaged time for target students. The results show that students were engaged from about 70 percent of the allotted time--a figure which appears consistent with other studies. But if one looks at the median productive minutes per day, one finds less than 30 productive minutes a day for reading in either grade 2 or grade 5, and less than 25 minutes per day in math. Such figures suggest that students are currently not being overloaded with practice in basic skills.

Direct Instruction

The second concept, direct instruction, is related to the concept of academic engaged time. The term is relatively new, and apparently was developed independently by a number of researchers in the last three years. The meaning of the term is still being developed, and the definition is still loose. I use it to refer to those activities which are directly related to making progress in reading and mathematics and to those settings which promote those activities. Essentially, it refers to those variables which promote content covered and academic angaged time. A number of instructional variables fit the concept of direct instruction.

To give an overview of the results, direct instruction refers to high levels of student engagement within teacher-directed classrooms using sequenced, structured materials. As developed below, direct instruction refers to teaching activities focused on academic matters where goals are clear to students; time allocated for instruction is sufficient and continuous; content coverage is extensive; student performance is monitored; questions are at a low cognitive level and produce many correct responses; and feedback to students is immediate and academically oriented. In direct instruction, the teacher controls instructional goals, chooses material appropriate for the student's ability level, and paces the instructional episode. Interaction is characterized as structured, but not authoritarian; rather, learning takes place in a convivial academic atmosphere.

Let us understand the task. The goal is to move the students through a sequenced set of material or tasks. Such materials are common across classrooms, and have a relatively strong congruence with the tasks on the achievement tests.

Note that we are limiting the term direct instruction to didactic ends, that is, for instruction toward rational, specific, analytic goals which appear on the reading tests we are currently using. These didactic exercises predominate both the reading and math materials currently in use as well as the reading and math tests.

Now, let us turn to the results. The choice of instructional variables selected for this review is illuminating and shows how we have progressed in the last few years. We no longer have lists of promising variables such as clarity or criticism. Instead, the results are organized into seven topics which appear to reflect the organization and management of classrooms more appropriately. These topics are:

- the role of the teacher
- student choice
- groupings
- management
- seatwork
- discussion
- atmosphere

Table 2

Allocated and productive minutes in reading and math (After McDonald, 1976).

Reading	Grade 2	Grade 5
Median allocated minutes	35.64	33.75
Median productive minutes	28.00	22.21
Percent productive time	78.00	66.00
Mean allocated minutes	63.30	55.00
Mean productive minutes	47.72	42.04
Percent productive time	75.00	76.00
Mathematics		
Median allocated minutes	18.27	30.92
Median productive minutes	15.15	23.95
Percent productive time	83.00	77.00
Mean allocated minutes	37.54	48.00
Median productive minutes	28.82	35.44
Percent productive time	76.00	74.00

Teacher-centered. The studies by Soar, Stallings and Kaskowitz, and Solomon and Kendall showed that the teachers who most successfully promoted achievement gain played the role of a strong leader; that is, they directed activities without giving their students choices, approached the subject matter in a direct, business-like way, organized learning around questions they posed, and occupied the center of attention. In contrast, the less successful teachers made the students the center of attention, organized learning around the students' own problems, and joined or participated in student activities.

Student choice of activity. The converse of teacher-centered, student choice of activities--yielded negative results. Classrooms which were organized so that students have a great deal of choice about the activities they will pursue are usually ones with lower academic engaged time and lower achievement. For example, in the study by Soar (1973), student free choice, student limited choice and free work groups were associated with lessened achievement gain. For Stallings and Kaskowitz (1974), child selection of seating and work groups and a wide variety of concurrent activities yielded similar consistent negative correlations with achievement gain. These two studies were limited to children of low SES backgrounds. However, Solomon and Kendall (1976) obtained the same results in their study of children in thirty fourth grade suburban classrooms. In this study, classrooms in which students chose their own activities and followed their own interests, were responsible for class planning, and were not teacher dependent were also the classrooms which were characterized by rowdiness, shouting, noise, and disorderliness. In Solomon and Kendall's study this

permissiveness, spontaneity, and lack of control classroom characterization were negatively related, not only to achievement gain, but also to positive growth in creativity, inquiry, writing ability, and self-esteem for the students in those classrooms. Similarly, in an unpublished study by Good and Beckerman on student engagement in six 6th grade middle class and lower classrooms, students were more engaged when the teacher assigned the work than when the students chose the work.

These results do not mean that all attempts at informality were disastrous, but rather that extremes of student autonomy and self-direction were usually associated with less task orientation and student engagement and consequently, less student gain on all measures. A possible explanation of these results is that when students have many choices, among a variety of activities and are not in groups being supervised by a teacher, they are particularly susceptible to distraction and find it difficult to stay on task for a productive period of time. Evidence for this explanation of distractability was obtained in a thoughtful ecological study by Kounin and Doyle (1975). They found that preschool children were quite attentive at construction tasks at their desks when the materials were arranged beforehand. But when students had to frequently leave their seat to obtain materials, they were highly susceptible to distraction.

Grouping students for learning. The studies of primary grade classrooms point to the need for adult monitoring and supervising of student activities. Stallings and Kaskowitz found that time spent working with only one or two students, was negatively related to class achievement gain, whereas time spent working with small groups (three to seven students) or with large groups was consistently positively related to achievement.

Similarly, classes which had a wide range of concurrent activities also had lower achievement scores, suggesting that teachers were unable to supervise such a variety of activities. Likewise, Soar (1973) discovered that when students worked in groups under adult supervision, correlations with achievement were positive and often significant. On the other hand, when small groups met without an adult, correlations between this grouping pattern and achievement were negative and often significant. A simple fact may be inferred from the studies cited: given that many students do not engage in on-task behavior unless a teacher or another adult is monitoring their academic activities, the use of large group settings allows for more adult supervision. Although many educators advocate working with one or two such an arrangement precludes adequate supervision for the remaining children. As a result, most of the children have less academic engaged time.

Management. Management is a critical problem which has not received enough attention. Classes with poor management usually have low academic engaged time. For example, teacher procedural contacts with students were negatively related to achievement gain in studies by Brophy and Evertson and by Good and Grouws, suggesting that procedural activities do not represent academic engaged time.

A major objective for future research is learning how to manage students when they are working alone. Although informal classrooms typically have a large number of students working alone, students in all classrooms spend from 50-70 percent of their time working alone. For example, in formal classrooms where a single teacher is responsible for three reading groups, two-thirds of the students will be expected to work alone at all times. We need to know how to increase academic engaged time for students

left on their own in such settings. There has not been sufficient exploration of the teacher behaviors that help keep students occupied. A few tentative but sensible suggestions emerged from a study of more-effective and less-effective classrooms in second and fifth grade reading or mathematics (Tikunoff, Berliner and Rist, 1975). In that study, effective teachers allocated sufficient time to an activity and were not bound to the clock as a guide for starting or stopping activities. Similarly, time allocated to a subject was continuous, without abrupt shifts from instruction to behavior management to announcements to large group instruction.

Students working privately. Questions and answers, discussion, and other types of oral classroom activities may not be so prevalent as once thought. In a recent study (McDonald, 1975) of 40 second grade and 40 fifth grade classrooms in California, the dominant activity was seatwork which occurred from 42 to 62 percent of the time. (See Table 3). Good and Beckerman obtained similar results in six 6th grade classrooms, with seatwork also occurring 51 percent of the time.

Note that "seatwork" as used by McDonald, by Good, or by me does not refer to the limited experience of students copying on a ditto sheet. Rather, seatwork refers to those activities students are doing privately such as reading a book, completing a workbook, writing a report, or using special cassettes machines, or books. In reading and mathematics instruction, students are proceeding through a fairly common series of linear tasks, and in doing these tasks they are interacting with materials much more than they are interacting with a teacher. The current research shows (e.g., McDonald, 1976, Stallings and Kaskowitz, 1975) that unsupervised students are less academically engaged than supervised students.

Table 3

Summary of Time Spent (After ETS report to California Commission)

Activity	2nd grade Reading	2nd grade Math	5th grade Reading	5th grade Math
Seatwork	42.4	49.8	56.6	62.5
Question and answer	14.8	14.7	9.1	11.4
Discussion	6.2	11.0	10.2	6.2
Lecture	1.3	0.0	4.0	3.3
Recitation	9.1	0.4	6.1	0.0
AV, game, demonstration	10.0	12.8	2.4	6.5
Unknown	16.2	11.3	8.8	10.3

Therefore, a major problem is maintaining student engagement in seatwork. The solution which successful teachers appear to have worked out is to supervise seatwork in a large group setting, and to thus avoid working with smaller groups and individual students. Hopefully, other reasonable alternatives are available.

In the organization and supervision of seatwork, the only question which has been studied is the advantage of teacher initiated versus student initiated contacts during seatwork. Studying middle class students, both Good and Grouws and Brophy and Evertson found that teacher initiated contacts during seatwork were negatively related to achievement gain, whereas student initiated private contacts were positively correlated with achievement gain, particularly when the teacher responded with process feedback. In these studies, there appears to be an advantage in the teacher being available to provide help when needed. No other studies were found which directly coded seatwork interactions.

Verbal interaction. New issues and problems are emerging in the area of questions and discussion.

1. Prevalance of discussion. Discussion may not be as prevalent as once thought. As noted from McDonald's study, all verbal behavior--discussion, drill, recitation, and lecturing may occur only about 20 to 30 percent of the time. In most of these studies, the elementary teacher today is much more a manager of students on materials and tasks than she is a leader of discussion.

2. Factual questions and controlled practice. The frequency of factual, single-answer questions is positively related to achievement gain in most of these studies. Stallings and Kaskwitz found that the frequency of

academically focused direct questions at the two lower levels of the Bloom Taxonomy resulted in increased acquisition of basic arithmetic and reading skills. They identified a factual question--student response--teacher feedback pattern as most functional. Using a sample of low-income students, similar to those in the Stallings and Kaskowitz's study, Soar (1973) also found that factors with high loadings from variables such as convergent questions, drill, or questions that have single answers usually correlated positively with achievement. The results suggest that a pattern of "controlled practice" consisting of factual questions, student academic responses, and adult academic feedback appears to be functional.

Medley, in his review (1977) extrapolated two types of controlled practice patterns. The successful pattern for low SES children is one with simple questions, a high percentage of correct answers, help to the student when he doesn't know the answer, and infrequent criticism. For high SES students, the successful pattern included harder questions and fewer correct answers (about 70 percent correct answers), little discussion and amplification of correct answers, criticism for incorrect answers, and calling on another student when a student doesn't know the answer. A similar type of pattern had a positive but non-significant trend in the study by Solomon. A similar pattern, labeled "recitation" was most successful in moderate amounts of Soar's study of 5th grade middle classrooms. Thus, controlled practice appears to be generally functional.

3. Higher order questions. Although teachers have been urged by teacher educators to ask higher cognitive level questions, recent research does not support this emphasis. In Stallings and Kaskowitz's study, the frequency of open-ended questions (i.e., questions high in the Bloom Taxonomy)

was negatively related to student achievement gain. In Soar's study, factors with loadings from variables like divergent questions and open-ended questions usually correlated negatively with achievement.

In two extremely well-designed experimental studies (Gall et al., 1975; Stanford Program on Teacher Effectiveness, 1976). Teachers were semiscripted in that they were provided with scripts containing the questions to be asked and responses to be given. Overall, both studies found that classes where students were asked more recall questions did slightly better on the recall tests, whereas all classes did equally well on tests which included higher level questions no matter how many higher-level questions had been asked in class. In other words, asking different numbers of higher-level questions had no measurable effect on essay performance or on tests containing higher level questions.

Perhaps there is confusion over what is meant by higher cognitive level questions. Questions that require a student to search the text and infer (e.g., "What words tell you that Mary felt sad?") are frequently coded as lower order because they have a single answer to be taken from the text, whereas questions of opinion (e.g., "How do you think Mary felt?") are frequently coded as higher level because they have more than one possible answer, although none of those answers are found in the texts. Therefore, the inferential "lower" questions, which require searching the texts may be more representative of academic engaged time.

Many questions which are coded as "higher level" may really be personal and opinion questions. In the studies by Stallings and Kaskowitz, by Soar, and by Brophy and Evertson, open-ended questions, personal experience questions, and opinion questions were negatively correlated with achievement. Such results suggest that these questions are best categorized as outside

the content to be covered and do not represent academically engaged time. Similarly, questions of opinion about a text (e.g.,"How do you think Mary felt?") may represent non-academic questions.

If one inspects the comprehension questions which appear in the basal series workbooks (see Armbruster, Stevens, and Rosenshine, 1977) one notes a general similarity between the types of questions which appear in those workbooks and the questions which appear on standardized reading tests. In this sense, the workbooks are "practicing the test." From this point of view, it makes sense to expect that verbal activities which represent controlled practice would be positively related to achievement gain, whereas the other types of verbal activities would be unrelated to achievement gain because they are too far from the types of skills required for the test. Although verbal questions such as "what is a good title for this story" or "how would you summarize this paragraph" may be considered as lower level by many educators, it is these skills which appear on the tests; questions which are coded as interpretive or critical thinking simply do not appear on achievement tests.

4. Other types of discussion. Beyond controlled practice, or recitation, the advantages of other types of discussion is not clear. Two other types of questioning patterns appear across these studies:

convergent questioning with amplification and elaboration

open questions with encouragement of expression

Both types have a slight negative trend with achievement gain when they appear. However, it is difficult to interpret even this finding because in the studies by Soar and Solomon, andpossibly by McDonald, we don't know whether such discussion even took place during reading and math because the subject area was not identified in coding or was not used in forming variables for analysis.

5. Student initiated talk. With the exception of the study by Good and Grouws, student initiated talk in discussion is not emerging as a significant correlate, student initiated contacts during seatwork, however, remain positively correlated with achievement gain.

Atmosphere. An environment that stresses academic achievement, making use of many of the components of direct instruction discussed earlier, need not be coercive or aversive. In fact, classrooms which have high achievement gain frequently have a warm atmosphere. For example, in the ethnographic study by Tikunoff, Berliner, and Rist (1975) the higher achieving classrooms were observed as being convivial, cooperative, democratic, and warm whereas in the lower achieving classrooms there was more belittling, shaming of students, and use of sarcasm. Furthermore, competitiveness did not distinguish between higher achievement and lower achievement. Other studies, such as that of Solomon and Kendall, also found that teacher criticism of student behavior, shouting, scolding, ridicule, and sarcasm were consistently negatively related to achievement gain.

These studies indicate that there is no need for teachers to be harsh and demeaning in order to obtain academic engaged time, and that decent, humane, genuine interactions occur in many classrooms which are highly structured and teacher directed.

Discussion

A fairly clear and consistent pattern emerges from the studies cited. Student time spent engaged in relevant content appears to be essential for achievement. Therefore, effective classroom teaching of basic skills takes place in an environment characterized by an emphasis on academic achievement.

Teaching behavior which is not directly aimed at furthering academic achievement of the kind measured by standardized achievement tests will not result in much academic gain in these areas. Teachers who make a difference in students' achievement are those who put students into contact with curriculum materials and find ways to keep them in contact. Although nonacademic activities, nonacademic questions, and a concern with a student's opinions and personal life may have motivational value, such activities do not in themselves represent academic engaged time. In addition, as laudable as it may seem to offer choices to students and to have them work on their unique, individualized assignments, such activities are usually low in academic engaged time.

The more successful teacher is one who structures and selects the activities, who obtains a large number of academic engaged minutes each day, who tends to ask questions which have specific answers in a controlled practice format, who places students in groups where they are supervised by the teacher, and who does this in a controlled but convivial classroom.

Value questions. There is something grim about this picture of direct instruction: large groups, teacher decision making, limited student choice of materials and activities, orderliness, factual questions, limited exploration of ideas, drill, and high percentages of correct answers. We immediately inquire about possible negative side effects.

Although there are a few exceptions, such as some early Follow Through data from Stallings, and balance of data to this date does not show negative side effects. In the two most recent Follow Through data, for Cohort III and IV, which entered school in the Fall of 1971, the two models which had the highest proportion of significant positive results on the Coopersmith

Self-Esteem Inventory were: Oregon's Direct Instruction and Kansas' Behavior Analysis--the two most structured, direct instruction programs. Similarly, in the study of middle class children by Solomon, the factor labeled "control and orderliness" was not only significantly related to achievement gain, but was significantly related to total gain in creativity, inquiry skill, writing quality, and self-esteem. In Bennett's study, the students in the informal classrooms do report better attitude toward school, but they also report more anxiety than students in other classrooms, a finding which matches Wright's report of lower achievement and higher test anxiety in informal classrooms.

The image of the formal classroom as humorless, cold, regimented, military workplaces simply may not be true. The effective formal classrooms are not cold and critical--McDonald found criticism was relatively rare in California classrooms, being concentrated mainly in the less effective classrooms. Teachers in formal classrooms today are warm, concerned, flexible, and allow much more freedom of movement. But they are also task oriented and determined that children shall learn.

One recalls some European classrooms in which children were sent at age four to learn to read from teachers who had failed at all other professions. They were taught long hours, in dingy rooms, and their first reading was to learn prayers--in a language that was never spoken in the home. Out of this came a group that is particularly noted for their sense of humor and love of learning--I'm describing the schtel schools of the Jews of eastern Europe.

But let us discuss the issue further by looking at didactic and heuristic instruction.

Didactic and heuristic instruction. The above discussion, particularly the points on individualizing and student choice, remind us of the age old controversy in education between a model of didactic, formal, controlled instruction on one hand, and heuristic, informal, inquiry, discovery instruction on the other. The evidence here suggests that it is the formal model with its behavior-analytic, detail-specific, teacher-directed, large group, and narrow questioning approach which is most effective for obtaining gains in reading and mathematics. The goal in such instruction is developing left-brained activities--the rational, analytic processes, and the approach mirrors the rational analytic goals.

At the other end we have the more open model of instruction which focuses on inquiry, learner-choice, individualized work, learner interests, and time for exploration and discovery. Such approaches suggest right-brained processes, and seem appropriate for developing intuitive and creative skills. It would seem that each approach may be most effective for its own end, and mixing approaches--such as using analytic, teacher-directed procedures to teach creative skills, or vice-versa--is not particularly effective.

I have visited a small "free school" which use both approaches, but separately in their instruction. Mornings in these schools are spent in structured programs in reading, writing, and mathematics. The teachers make the assignments but the children complete them anywhere in the room in a relaxed and informal manner. These assignments are from the same sequential, structured workbooks and readers that are used in traditional schools. Although each child works at his own task and at his own pace, no more than two activities, such as reading and writing, occur at the same time. Although the atmosphere is relaxed, informal, and respectful,

the setting is large group, teacher centered, and structured. Afternoons are given to projects, exploration, messing around, trips, and discussion. Fridays are for hobbies and crafts. Thus, the school teaches didactic goals, such as reading and math, in a didactic way; and spends the remaining time on more open activities. This approach seems intuitively appealing and sensible. I am not sure whether such an approach is possible on a large scale, or with children who come from homes with less verbal, activist parents.

Summary. This paper has focused on content covered and student attention and engaged time. This represents a major shift from the past practice of looking at teacher variables such as affect, warmth, criticism, clarity, amount of teacher talk, enthusiasm or probing. The focus is away from lists of specific classrooms teacher behaviors to an emphasis on academic engaged minutes and the variety of procedures which might be used to obtain academic engaged minutes. There are no lists of essential teacher behaviors (although there are suggestions), nor is it claimed that any one type of teaching method or style is inherently superior. Thus, we can recognize the advantage of informal classrooms which are high in academic engaged time as well as the disadvantage of disorderly, formal classrooms (e.g., Marshall, 1977).

The primary goal of a teacher is obtaining "sufficient" student content covered and academic engaged minutes. (Needed research on defining "sufficient" or "reasonable" will be discussed in the next section). But a teacher has a number of options. One would be to run a structured, orderly, teacher-directed classroom, with an academic focus, and frequent monitoring and supervision of the students. The research suggests that such classrooms are high in percentage of engaged time per minute and can also be warm and

encouraging. However, a teacher could also choose a more flexible setting in which there is more individual work and/or more student choice. We know, that students in such settings tend to expend less engaged time per minute. Therefore, a teacher could use such settings only if he or she increased the allotted time. This extra time could be obtained by decreasing some of the support and transitional activities. A third option would be for a teacher to critically examine his or her own teaching to determine how successful the current procedures are for obtaining academic engaged time. A teacher whose unique blend of procedures are obtaining sufficient academic engaged time need not change those procedures.

Research Questions

The major research question is that of discussing just how much more knowledge is needed in the area of instructional procedures for obtaining achievement gain in didactic areas such as reading and mathematics. I would hope that at some time we could consider this research area generally finished, and could turn more time and energy to instruction for heuristic or philetic ends. Yet, some major research issues remain and these are discussed in the hope that others will see these areas as worthy of study.

Academic engaged minutes and content covered. The major research question is learning how much content covered and academic engaged minutes is sufficient and reasonable for making normal progress in reading and mathematics. We simply do not know how much content needs to be covered for an average student to make average progress.

There is a great need for descriptive data on the percentage of engaged time which is obtained in different settings, as well as on the setting

variables which may contribute to engaged time. Such descriptive research is quite different from the observation systems of the 60's because in this case the variable, academic engaged time, is a reasonable proxy for student achievement.

Normative studies. Aside from McDonald's study, there is little normative data on academic engaged time. Descriptive data on engaged time in low SES classrooms would be particularly interesting, because this might help explain the low achievement scores and the apparent low content covered. Illustrative normative studies could include:

engaged time per child, per day, per subject area, per grade.

engaged time divided into activities within a subject area (e.g., reading, writing, listening)

percentage of engaged time in different contexts (e.g., working alone, in teacher supervised seatwork). One issue would be replicating the data reported above on some contexts being more engaging than others.

percentage of engaged time in engaged time and activities in different types of classrooms such as formal and informal. The approaches used by Gump (19) would be particularly valuable here.

Preliminary results suggest that students are engaged in academic activities about 75 percent of the allotted time in reading in formal classrooms and about 65 percent of the allotted time in informal classrooms. But such statements are tentative and need to replicated in a number of studies.

We also need more analytic-descriptive studies such as those of Kounin (1975, 1976) in which he attempted to determine the possible causes for different engagement in different settings. Kounin's idea of signal continuity influencing engagement might be applied and extended to elementary school contexts.

Experimental studies. Experimental studies are vitally needed in this area. We don't know the number of engaged minutes or the amount of content covered per day which are reasonable, sufficient, or humane. This last point is particularly important for low achieving children. Children who are reading two or three years below grade level are going to need to spend a great deal of time on reading if they are ever to catch up. Such children may need to spend two or three hours a day in reading if they are ever to make two year's progress in one. But 90 to 120 academic engaged minutes per day may simply be too much for these children.

We have been writing as if all types of engaged time in reading are the same, and this seems unlikely. Certain types and sequences of practice may be more important than others. We have also written as if 100 minutes with the McGraw Hill Programmed Readers is the same as 100 minutes with Ginn 360 or Economy materials at the same level. This may or may not be so. It may be that if students work on materials which are at moderate difficulty for them then reasonable materials are equivalent. This issue also merits study.

Student choice and individualization. Four types of student choice in individualization have been noted by researchers:

choice of task or activity,

choice of time and sequence for doing prescribed activities,

choice of behavior (e.g., where to work, when to leave seat).

choice of how to think about the subject matter

Based on present research, it is the choice of task setting that seems most dysfunctional; whereas choice of behavior seems most functional (perhaps because it signals a flexible, albeit task-oriented teacher). The area of

choice of time and sequence is rather interesting for future research, and is being studied in the current work at the University of Pittsburgh.

Wang (1976) conducted a number of small scale experiments in the context of Individually Perscribed Instruction classrooms in which students had choice as to when to do their teacher-assigned work. Under these conditions, these students--who also had prior training in working alone--increased both their attention and the number of units completed when they had choice as to when to do their work. This type of student choice merits research in contexts other than IPI. Similarly, in a correlational study of IPI classrooms, Leinhardt (1975) found that extensive choice was disfunctional, whereas limited choice (e.g., what topic to study, when they needed special tutoring) was functional.

Thus, there is a need for more research on the types of student choice which might be functional, as well as on the prior conditions which facilitate student choice.

Similarly, two types of individualization have been distinguished within recent research on teaching:

> students working on different subject matter,
>
> students working on different activities within the same subject matter.

In the studies by Soar and by Stallings, the negative correlations between "variety of activities" and elementary student achievement occurred primarily for situations in which students were working on different subject matter (e.g., reading, science, dance) at the same time. It is suggested that this situation may be particularly difficult for a teacher to monitor. In contrast, students who are working on different activities within the same subject matter may be easier to monitor, and such a setting

may be more responsive to offering a student more than one set of materials or activities for mastering a skill. Thus, the two settings should be distinguished in future research.

Seatwork and work groupings. As noted, seatwork is a relatively unstudied area. The first task is descriptive, and could focus on the percent of allotted time for seatwork, and the percent of engaged time in different contexts. The major seatwork contexts, as developed by Marliave and others at the Far West Laboratory are: working with others vs working alone, self paced versus teacher paced work, and teacher supervised versus unsupervised. ("Teacher paced groups" would be discussion or recitiation groups). As one learns to rank these contexts according to percent of academic engaged time, hopefully, we can proceed, as Kounin has done, to develop concepts to explain probable causes of these differences.

A related set of descriptive-correlational tasks involve identifying effective teachers (much as the above researchers have been doing) and learning their techniques for structuring and supervising seatwork. Such topics include how these teachers prepare students for their tasks, how they structure the distribution of materials and the shift from one topic to another, whether the successful teachers "make rounds" or whether they work at their desks with an eye out for problems, and how these teachers respond to student requests for help and clarification.

But the major problem lies in maintaining student engagement when they are not being supervised. Many teachers find it very difficult to both work with a small group of children and manage seatwork at the same time. The solution which successful teachers appear to have worked out is to supervise seatwork in a large group setting, and to thus avoid working with

smaller groups and individual students. Given the problems of managing 28 children, this may be the best solution. But although large group grill, drill, and supervise is an effective arrangement, probably the most effective, we hope that other, reasonable alternatives would be available.

Another approach would be to conduct experimental studies aimed at increasing student engagement during seatwork. Good is currently (1977) conducting an experimental study on seatwork, and the staff at the Far West Laboratory are running small studies on increasing student academic engaged time. Such studies are urgently needed.

Seatwork materials. Some materials which students use when working privately (e.g., readers, books, workbooks) are probably more engaging than others. Yet, we know little about them. Developing or identifying engaging materials could be a major research area.

Verbal interaction versus seatwork. A preplexing problem which is emerging is the value of time spent on verbal interaction as compared to time spent on particularly for middleclass students. In 2nd and 3rd grade math, Brophy and Evertson found that public discussion was more productive than seatwork; whereas McDonald in 2nd grade math found that seatwork with the teacher directing the students to task was most productive. In 4th grade math, Good and Grouws found seatwork to be most productive with all types of verbal questioning coming out negative; whereas McDonald found that in 5th grade math it was best to teach the class as a whole using explanation, discussion, and questions. Similar to McDonald, with their fourth grade sample, Solomon and Kendall found negative (but non-significant) trends for all types of teachers interactions during seatwork--including

giving requested help and unrequested help--whereas all types of interactions with the whole class had a positive (but non-significant) trend. In sum, the issue as to the relative merit or seatwork versus verbal activities is confusing.

Adding to this confusion is Kounin and Gump's (1975) work with preschool children in which they found that construction seatwork activities were more engaging than discussion. They reasoned that this was because the signals to the child were more continuous during the seatwork activities. It is dangerous, of course, to extrapolate work with preschool children to mathematics at the 4th grade, but hopefully, we will use some of the concepts or conceptual thinking developed by Kounin in approaching this puzzle.

We now need to reconsider the relative value of seatwork versus discussion for achievement gain in areas such as reading comprehension. As noted below, there is a strong correspondence between the controlled practice pattern used in "discussion" and a similar pattern in the workbooks. Similar questions are asked in each case. But we don't know when there is value in conducting this practice verbally, and when it is more efficient to let the workbooks do it. One type or the other may be more effective than the other for different types of students. One problem with the teacher-led controlled practice is that all students may not participate, yet, others may gain more through the modeling of the more able students. But according to Kounin, discussion may not produce as much academic engaged time as supervised seatwork because the signals are more continuous in seatwork. The area is presently unclear.

Another issue is the overall value of discussion. One could argue that discussion aids reading comprehension gain because it requires the students to consider and reconsider concepts, and that it promotes active cognitive processing--skills which should enhance reading comprehension. This is the type of argument McDonald used to interpret his findings for 5th grade reading. There is an appeal to this argument which merits increased exploration and research.

FOOTNOTES

1. This paper is both a summary and expansion of three previous papers: Rosenshine (1976), Berliner and Rosenshine (1977) and Rosenshine and Berliner (1977). Many of the ideas were developed jointly with Dave Berliner. Many of the well received summary sentences in this paper were originally written by Berliner, and were taken from the Berliner and Rosenshine paper. The immediate parents of the concept of Academic Learning Time are Berliner, Charlie Fisher, and Rick Marlieve of the Far West Laboratory. The grandparents include John Carroll (1963) who originated the idea of "opportunity to learn," (Husen, 1967), and Nate Gage who insisted that I code content covered on my dissertation study.

   The term direct instruction also has many parents and grandparents. Fred McDonald and I independently same up with the term in publications in 1975, although the term has been used in many informal conversations, particularly with Berliner, for years before that. We have no idea who first used this term. In the trademark DISTAR which was first used in 1969, the D and I stood for direct instruction.

2. I wish to give thinks to my friends and colleagues -- Dave, Ken, Jean, Jane, Norma, Charlie, Garry, Sam, Marcienne, Nate, Lee, Tom, Carolyn, Mike, and Lou -- who gave a little help as I proceed through my mid-career crisis; to Jere Brophy and Sig Tobias who selected me for the AERA presentation; to Jean Osborn, Bonnie Armbruster and Tom Good who contributed ideas and editing.

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